WHAT IS CLAIMED IS:

1. A semiconductor device comprising:

a substrate including a source and drain, the source having a first edge and the drain having a first edge;

a gate between the source and drain, the gate having a first portion; and

a first deep trench structure located under the first portion of the gate and proximate to the first edge of the source and the first edge of the drain.

2. The semiconductor device of claim 1 further comprising:

the source having a second edge and the drain having a second edge;

the gate having a second portion; and

a second deep trench structure located under the second portion of the gate and proximate to the second edge of the source and the second edge of the drain.

3. The semiconductor device of claim 2 wherein the first edge of the source and drain are approximately parallel to the second edge of the source and drain, and wherein the first and second deep trench structures are approximately parallel the first and second edges, respectively.

4. The semiconductor device of claim 1 wherein the first deep trench structure has a depth greater than 0.5 μm.

5. The semiconductor device of claim 1 wherein the first deep trench structure exhibits a geometry selected from the group consisting of a straight line, an angled line, a broken line, and a combination thereof.

6. The semiconductor device of claim 1 further comprising:

an outside edge on the source;

an outside edge on the drain; and

the first deep trench structure having a length extending at least from the outside edge of the source to the outside edge of the drain.

7. The semiconductor device of claim 1 wherein the first deep trench structure is substantially filled in with a material selected from the group consisting of silicon dioxide, silicon nitride, silicon oxynitride, a high k material, and a combination thereof.

8. The semiconductor device of claim 1 wherein the substrate is made of a material selected from the group consisting of crystal silicon, polycrystalline silicon, amorphous silicon, germanium, diamond, silicon germanium, silicon carbide, gallium arsenic, indium phosphide, semiconductor on insulator, and a combination thereof.

9. The semiconductor device of claim 1 wherein the device includes a strained MOS structure.

10. The semiconductor device of claim 1 further comprising:

a neighboring semiconductor device; and

a first shallow trench isolation structure located between the semiconductor device and the neighboring semiconductor device.

11. The semiconductor device of claim 10 further comprising:

a second shallow trench isolation structure adjacent to the drain wherein the drain is situated between the first shallow trench isolation structure and the second shallow trench isolation structure.

12. The semiconductor device of claim 11 wherein the gate is extended to partially overlay the second shallow trench isolation structure.

13. The semiconductor device of claim 1 further comprising:

a body contact feature adjacent to the source.

14. The semiconductor device of claim 1 wherein the gate includes a gate electrode and a gate dielectric

15. The semiconductor device of claim 15 wherein the gate electrode is made of a material selected from the group consisting of doped polysilicon, metal, metal alloy, metal silicide, and a combination thereof.

16. The semiconductor device of claim 15 wherein the gate dielectric is made of a material selected from the group consisting of silicon oxide, silicon oxynitride, a high k material, and a combination thereof.

17. The semiconductor device of claim 1 wherein the first deep trench structure extends around the entire device.

18. A semiconductor device comprising:

a substrate including a source and a drain, the source having a first edge and the drain having a first edge;

a gate electrode on the substrate and between the source and drain, a first portion of the gate electrode extending past the first edge of the source and the first edge of the drain;

a first deep trench structure located under the first portion of the gate electrode and proximate to the first edge of the source and the first edge of the drain.

19. The semiconductor device of claim 18 further comprising:

the source having a second edge and the drain having a second edge;

a second portion of the gate electrode extending past the second edge of the source and the second edge of the drain;

a second deep trench structure located under the second portion of the gate electrode and proximate to the second edge of the source and the second edge of the drain.

20. The semiconductor device of claim 19 wherein the first edge of the source is approximately parallel to the second edge of the source, the first edge of the drain is approximately parallel to the second edge of the drain, the first deep trench structure is approximately parallel to the first edges and the second deep trench structure is approximately parallel to the second edges.

21. The semiconductor device of claim 18 wherein the first deep trench structure has a depth greater than 0.5 μm.

22. The semiconductor device of claim 18 wherein the first deep trench exhibits a geometry selected from the group consisting of a straight line, an angled line, a broken line, and a combination thereof.

23. The semiconductor device of claim 18 further comprising:

an outside edge on the source;

an outside edge on the drain; and

the first deep trench having a length extending at least from the outside edge of the source to the outside edge of the drain.

24. The semiconductor device of claim 18 wherein the first deep trench structure is substantially filled in with a material selected from the group consisting of silicon dioxide, silicon nitride, silicon oxynitride, a high k material, and a combination thereof.

25. The semiconductor device of claim 18 wherein the substrate is made of a material selected from the group consisting of crystal silicon, polycrystalline silicon, amorphous silicon, germanium, diamond, silicon germanium, silicon carbide, gallium arsenic, indium phosphide, semiconductor on insulator, and a combination thereof.

26. The semiconductor device of claim 18 wherein the device includes a strained MOS structure.

27. The semiconductor device of claim 18 further comprising:

a neighboring semiconductor device; and

a first shallow trench isolation structure located between the semiconductor device and the neighboring semiconductor device.

28. The semiconductor device of claim 27 further comprising:

a second shallow trench isolation structure adjacent to the drain wherein the drain is situated between the first shallow trench isolation structure and the second shallow trench isolation structure.

29. The semiconductor device of claim 28 wherein the gate is extended to partially overlay the second shallow trench isolation structure.

30. The semiconductor device of claim 18 further comprising:

a body contact feature adjacent to the source.

31. The semiconductor device of claim 18 further comprising:

a gate dielectric adjacent to the gate electrode.

32. The semiconductor device of claim 18 wherein the gate electrode is made of a material selected from the group consisting of doped polysilicon, metal, metal alloy, metal silicide, and a combination thereof.

33. The semiconductor device of claim 31 wherein the gate dielectric is made of a material selected from the group consisting of silicon oxide, silicon oxynitride, a high k material, and a combination thereof.

34. The semiconductor device of claim 18 wherein the first deep trench structure extends around the entire device.

35. A semiconductor device comprising:

a substrate having a source and a drain, the source and the drain having widths that are substantially equal and each having a first edge substantially located along a common line on the substrate;

a gate electrode on the substrate and between the source and the drain, the gate electrode having a first portion extending past the first edge of the source and the first edge of the drain;

a first deep trench structure located under the first portion of the gate electrode, the first deep trench structure parallel to the common line on the substrate and proximate to the first edge of the source and the first edge of the drain.

36. The semiconductor device of claim 35 further comprising:

the source and drain each having a second edge parallel to their respective first edges;

a second portion of the gate electrode extending past the second edges of the source and the drain;

a second deep trench structure located under the second portion of the gate electrode and proximate to the second edges of the source and the drain.

37. The semiconductor device of claim 35 wherein the first deep trench structure is substantially deeper than 0.5 μm.

38. The semiconductor device of claim 35 further comprising:

an outside edge on the source;

an outside edge on the drain; and

the first deep trench structure having a length extending at least from the outside edge of the source to the outside edge of the drain.

39. The semiconductor device of claim 35 wherein the first deep trench structure is substantially filled in with a material selected from the group consisting of silicon dioxide, silicon nitride, silicon oxynitride, a high k material, and a combination thereof.

40. The semiconductor device of claim 35 wherein the substrate is made of a material selected from the group consisting of crystal silicon, polycrystalline silicon, amorphous silicon, germanium, diamond, silicon germanium, silicon carbide, gallium arsenic, indium phosphide, semiconductor on insulator, and a combination thereof.

41. The semiconductor device of claim 35 wherein the device includes a strained MOS structure.

42. The semiconductor device of claim 35 further comprising:

a neighboring semiconductor device; and

a first shallow trench isolation structure between the semiconductor device and the neighboring semiconductor device.

43. The semiconductor device of claim 42 further comprising:

a second shallow trench isolation structure adjacent to the drain wherein the drain is situated between the first shallow trench isolation structure and the second shallow trench isolation structure.

44. The semiconductor device of claim 43 wherein the gate is extended to partially overlay the second shallow trench isolation structure.

45. The semiconductor device of claim 35 further comprising:

a body contact feature adjacent to the source.

46. The semiconductor device of claim 35 further comprising:

a gate dielectric adjacent to the gate electrode.

47. The semiconductor device of claim 35 wherein the gate electrode is made of a material selected from the group consisting of doped polysilicon, metal, metal alloy, metal silicide, and a combination thereof.

48. The semiconductor device of claim 46 wherein the gate dielectric is made of a material selected from the group consisting of silicon oxide, silicon oxynitride, a high k material, and a combination thereof.

49. The semiconductor device of claim 35 wherein the first deep trench structure extends around the entire device.

50. A semiconductor device comprising:

a substrate including a source and a drain, the source having a first edge and the drain having a first edge;

a gate electrode on the substrate and between the source and drain, a first portion of the gate electrode extending past the first edge of the source and the first edge of the drain;

a current channel located in a region where the gate electrode extends beyond the first edge of the source and the first edge of the drain, the current channel allowing a leakage current to flow in the device;

a first deep trench structure located under the first portion of the gate electrode and proximate to the first edge of the source and the first edge of the drain, whereby the first deep trench structure is located close enough to the first edge of the source and the first edge of the drain to substantially eliminate the leakage current flow through the current channel.

51. A method of manufacturing a microelectronic device, comprising:

forming a substrate including a source and a drain;

forming a gate between the source and drain; and

forming a deep trench structure under a portion of the gate and proximate to an edge of the source and drain.